

***CARABUS AURATUS* L. AND *CLIVINA FOSSOR* L.
(COLEOPTERA: CARABIDAE): NEW RECORDS OF TWO
INTRODUCED TAXA IN THE NORTHWEST
AND NORTHEAST U.S.A.**

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Abstract.—*Carabus auratus* L. and *Clivina fossor* L. are newly recorded from Maine. The Pacific Coast distribution for *C. fossor* is extended to southern Oregon.

The documentation of the spread of introduced taxa into exotic environments, and changes in their known ecological preferences in these new habitats, is often not completed until a major taxonomic revision or study of the fauna of a particular region is undertaken. Much of what is known of the distribution of many organisms is passed by word of mouth among professionals with access to major museum collections, and often does not appear in the published literature for decades. This kind of information, however, is critical to those who use fossil remains in geological contexts as indices of environmental change. Important questions to such studies include: how rapidly can a given group of organisms disperse into a new environment and thereby reflect changing environmental conditions? How variable are the habitats in which a given organism can survive?

Numerous taxa, both plant and animal, have been introduced into North America since the advent of European colonization. (For instance, Hatch [1953] lists over 165 beetle taxa known to be introduced to the Pacific Northwest prior to 1952.) This report documents several new localities in the U.S. for two introduced Carabid beetle species, *Carabus auratus* L. and *Clivina fossor* L., both of which are apparently well established on this continent and presently expanding their respective ranges.

The applicability of documenting the spread of these and other introduced taxa to the paleobiogeographic questions posed above presupposes that the artificial range extensions involved reflect uninhibited expansion without significant competition, as would be the case, for instance, with insects expanding into recently deglaciated terrain. In the case of the flightless *Carabus auratus*, this range extension after initial introduction has likely been almost entirely accomplished by walking of both larval and adult individuals, occasionally augmented by human transportation in farm products, etc. Its spread northwards in New England is likely limited by the lack of suitable habitat; natural environments in this region are dominated overwhelmingly by hardwood and conifer forests. The only other species of *Carabus* taken in association with *C. auratus* is *C. nemoralis* Muller, also a European introduction into North America, although several individuals of the native species *C. serratus* have been collected in this same region (Nelson, unpubl. data).

In the case of *Clivina fossor*, the power of flight vastly improves the chances of individual beetles to disperse in search of new suitable habitats, and it should be

expected that this species would exhibit rapid range expansion once established. Palmén (1944; cited in Thiele, 1977) found it one of the more abundant Carabid species washed ashore along the southwest coast of Finland, evidence that this species does indeed utilize flight as a means for dispersal into new habitats. It is highly likely that its present range on both the east and west coasts of the U.S. extends considerably beyond that documented here. It is unlikely as well that this species faces significant competition from native species, particularly in disturbed agricultural areas, considering its southwards range expansion on the Pacific Coast by at least 20 km/yr since 1953. On the Atlantic Coast, it could very well have been in Maine for decades and remained undetected, inasmuch as this region has not been extensively collected and vast areas remain relatively unstudied.

CARABUS AURATUS LINNAEUS

Eighteen specimens of this distinctive, metallic green species have been recovered recently in the central Maine area, and numerous others have been observed but not collected. The species is apparently well established there. Lindroth (1961, p. 37) noted only that it was "a late introduction and established only in the coastal districts of New England." The localities reported here are some 40–50 miles inland from the coast and may well represent both inland and northwards expansion of the range from that previously recognized. The Smithfield specimen documented below was collected in an open stable yard, whereas the specimens from Sidney, Maine, were collected in a densely vegetated hayfield which has been mowed twice annually for decades. This site has recently been disturbed for construction of a home. Thiele (1977) noted that in Europe, the species is more common on cropland than in meadows or pastures, but it has not been observed in Maine in cultivated fields. Both the Smithfield and Sidney sites are in rural areas where it is more likely that this flightless species has become naturally established rather than artificially introduced from a distant population in southern New England.

Decimal coordinates for the more recent specimens listed below (for both species) follow Crawford (1983) as a means of precisely locating sites with a minimal number of characters.

Localities. MAINE: Somerset Co./ Smithfield: 44°46'N, 69°25'W/ VI-1984/ C. W. Ridky, coll. (1 specimen); Kennebec Co./ Sidney: 44.489°N, 69.689°W/ 11-VI-1985/ R. A. Reynolds, coll. (1 specimen); Kennebec Co./ Sidney: 44.489°N, 69.689°W/ 14-VI-1985/ R. E. Nelson, coll. (1 specimen); Kennebec Co./ Sidney: 44.489°N, 69.689°W/ 10-V-1986/ R. E. Nelson & R. A. Reynolds, coll. (6 specimens: 1 male, 5 females); Kennebec Co./ Sidney: 44.489°N, 69.689°W/ 18-V-1986/ R. E. Nelson & R. A. Reynolds, coll. (9 specimens: 6 males, 3 females).

CLIVINA FOSSOR LINNAEUS

According to Lindroth (1961, p. 161), this species was introduced into eastern Canada in 1915, and in the U.S.A. is known from just Washington State. Lindroth only recorded the species from the eastern half of Canada, although Finlayson and Campbell (1976) have since noted populations estimated at as many as 11,000 individuals per hectare in the lower Fraser River valley of southwestern British

Columbia. As regards the U.S. records, Lindroth cited Hatch (1953), who stated that the species was found in "western Washington, Seattle and vicinity" (Hatch, 1953, p. 66).

Ecologically, Lindroth (1961) indicated that *C. fossor* was found "in North America on cultivated, usually clayish soil" (Lindroth, 1961, p. 161). Larochelle (1976), however, has recently reported collecting the species by treading in an undisturbed marshy embayment in Quebec. Thiele (1977) notes that in Europe it is a species of moist meadows and agricultural land, including pastures.

The new records presented in this report indicate that: (a) on the Pacific Coast, *C. fossor* has expanded its range in Washington State to east of the Cascade Range, as well as southwards at least into southernmost Oregon; (b) the species has extended its range southwards along the Atlantic Coast at least as far as central Maine; and (c) the environments in which it is found on both coasts of the U.S. now include a wide variety of undisturbed natural habitats.

The specimens reported here have been collected in a boggy pasture with abundant organics and a clay-rich substrate (Edmonds, Washington); in a relatively dry pasture with a silty sand substrate (Kittitas Co., Washington); at the margin of cultivated fields (Somerset Co., Maine); in a moist, grassy pasture (Sidney, Maine); by treading in an extensive grass and cattail marsh (Belgrade, Maine); under rocks on the gravelly banks of small, shaded streams (Raging River, Washington; Messalonskee Stream, Maine); on sandy river banks in full sun (here in association with *C. oregona* Fall) (Snohomish River, Washington); and on exposed lake beaches of either coarse sand (Katahdin Lake, Maine) or sandy mud (Emigrant Lake, Oregon). The cultivated field and pasture sites are the only ones that resemble Lindroth's (1961) habitat description for the species in North America; the grass/cattail marsh resembles the habitat described by Larochelle (1976). The others represent previously unreported records of the utilization by this species of undisturbed natural habitats on this continent. Such broad ecological tolerance should be expected for a successful colonizer such as this species, but whether the individuals collected represent isolated colonizers or representatives of established, breeding populations has not been determined.

Localities. WASHINGTON: King Co.: Raging River, 2 km NNE of Preston/ under rock by stream/ 28-IV-1979/ R. E. Nelson, coll. (1 specimen); King Co./ 3.5 km East of Redmond/ in *Juncus* litter in boggy pasture/ 7-VI-1981/ R. E. Nelson, coll. (2 specimens); Snohomish Co.: Snohomish River, Monroe/ 16-V-1982/ R. E. Nelson, coll. [on sandy river bank in full sun—in company of *C. oregona* Fall] (1 specimen); Snohomish Co.: Snohomish River, Monroe/ 23-V-1982/ R. E. Nelson, coll. [on sandy river bank in full sun—in company of *C. oregona* Fall] (1 specimen); Kittitas Co.: 11 km ENE of Cle Elum/ under log in pasture/ 18-IV-1981/ R. E. Nelson, coll. (1 specimen). OREGON: Jackson Co.: Emigrant Lake/ 22-IV-1982/ R. E. Nelson, coll. [taken under debris on moist, muddy lake shore] (1 specimen). MAINE: Somerset County/ 44.594°N, 69.702°W/ 23-IV-1983/ R. E. & G. M. Nelson, coll. [under stones, margin of cultivated field] (2 specimens); Kennebec Co.: Messalonskee Stream/ 44.568°N, 69.686°W/ 26-V-1983/ R. E. Nelson, coll. [under stone on gravelly, shaded stream margin] (1 specimen); Kennebec Co.: Belgrade/ 44.448°N, 69.834°W/ treading in marsh/ 9-VII-1984/ R. E. Nelson, coll. (1 specimen); Kennebec Co.: Sidney/ 44.447°N, 69.744°W/ under log in pasture/ 27-IV-1986/ R. E. Nelson, coll. (1 spec-

imen); Piscataquis Co.: Katahdin Lake/ 29-VIII-1984/ R. E. Nelson, coll. [coarse, sandy lake margin in undisturbed area] (1 specimen).

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